Prospective K-8 Teachers Inductive Reasoning in the Context of Pattern-Related Problems

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INTRODUCTION

* Algebraic concepts are integral to K-8 mathematics curriculum (NCTM, 2000).

* Inductive reasoning (reasoning from specific premises to a general rule) is an important way of mathematical thinking.

* K-8 mathematic teachers need to foster inductive reasoning in their students.

RESEARCH GOALS

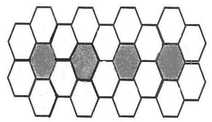
To characterize pre-service K-8 teachers inductive reasoning activities in the context of pattern-finding problems

METHOD

* 17 K-8 pre-service teachers (PST)
*130 written solutions to pattern finding tasks

Figure 1 below shows one of the assignments used. All other assignments were very similar to this one.

Your solution your should show the evidence of thinking that underlines the algebraic habit Building Rules to represent Functions and expectations of Understanding Patterns, Relations and Functions in Grades 5 – 8.



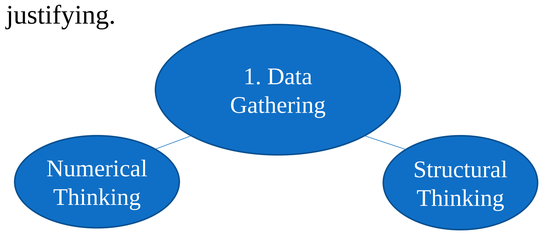
The city council wishes to create 100 flower beds and surround them with hexagonal paving slabs according to the pattern shown above. (In this pattern 18 slabs surround 4 flower beds)

(1) How many slabs will the council need?

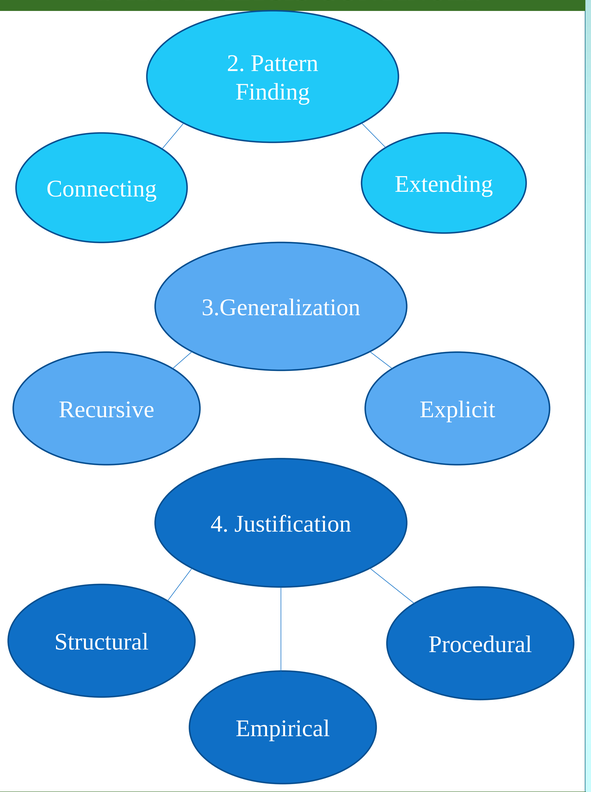
(2) Describe how the council can find the number of slabs needed for any number of flower beds.

DATA ANALYSIS

Qualitative analysis of inductive reasoning process on data gathering, pattern finding, generalizing & justifying.

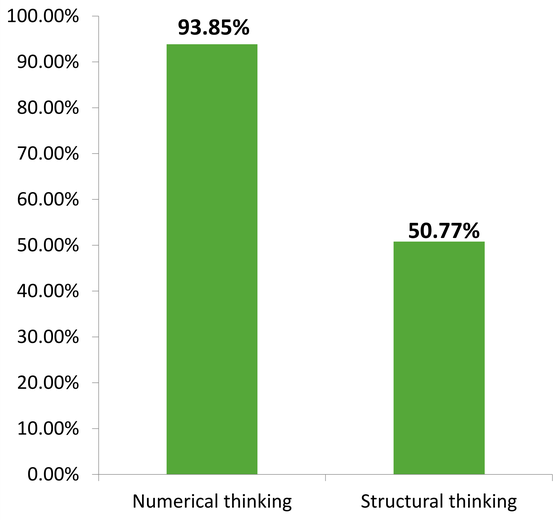


DATA ANALYSIS CONTINUED

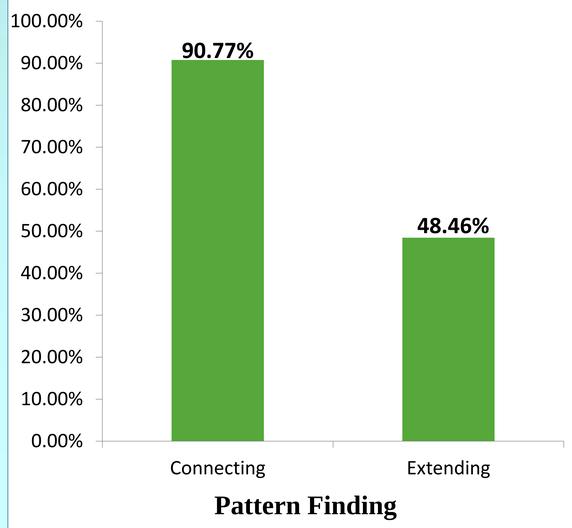


RESULTS

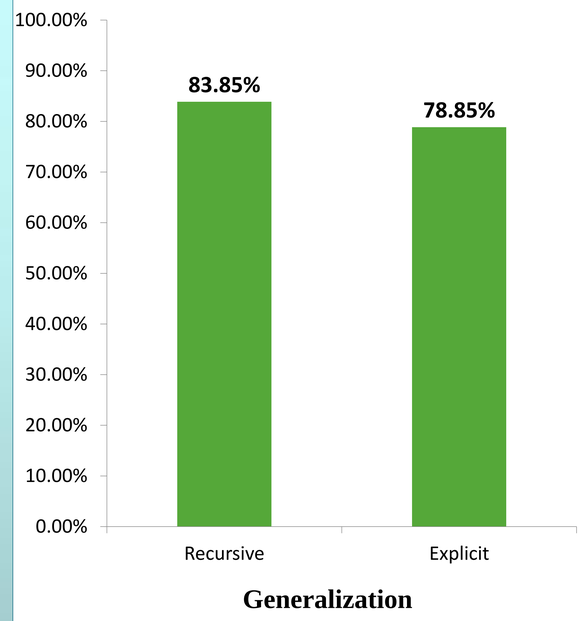
*Numerical thinking was more frequent than structural thinking in Data Gathering activities. (z= 7.76, p<0.05)



* Pattern finding activities identified as connecting were significantly more frequent than those identified as extending. (z=7.416, p<0.05)

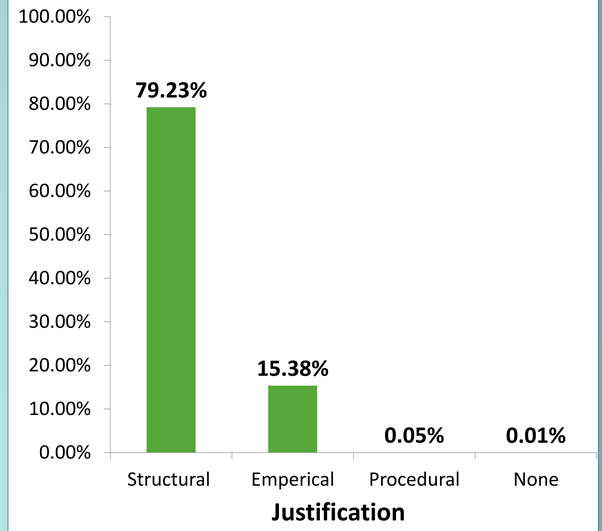


*Recursive and explicit generalizations were observed with similar frequencies. (z=.959, p<.05 (not significant))



RESULTS CONTINUED

*For justifying, a structural form was used a lot more frequently than empirical and procedural. (z=10.31, p<0.05 (structural vs empirical))



Conclusions

* PST's engage in inductive reasoning while solving pattern-related problems.

* While reasoning inductively PST's:
- Gather data using predominantly numerical thinking
- Seek changing attributes while analyzing patterns
- Use recursive and explicit rules while generalizing
- Justify structurally in most cases

REFERENCES

National Council of Teachers of Mathematics (NCTM), (2000). *Principles and standards for school mathematics.* Reston, VA: NCTM.

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